

## **Enhancing Understanding of Non-Work Trip Making: Data Needs for the Determination of TOD Benefits**

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### **ABSTRACT**

Many metropolitan planning organizations across the United States have embraced transit-oriented development (TOD) as their regional planning paradigm. Regional and local transit agencies have made -- or plan to make -- major investments in new transit capacity, particularly rail systems. These agencies expect that dense and mixed-use development around stations will follow and cause significant shifts away from automobile usage for both work and non-work trips. Federal transit support for construction of these new systems is conditioned on a showing of supportive land use patterns. And several separate federal initiatives have been mounted to encourage the integration of transportation with land development.

In spite of these unprecedented efforts, real benefits of TOD on a metropolitan scale remain problematic, in part because of the difficulty in estimating with sufficient certainty the market response to policies seeking major land use and transit system changes. In particular, the effect of TOD on non-work activities, from which a majority of all personal travel is derived, has not been thoroughly addressed. The analysis of travel for purposes of shopping, eating out, and recreation is complex because of the interplay of numerous variables that determine developer, store owner, and consumer reaction to transit investments, land use policies, and other government actions. New data and insights regarding the consumer marketplace are obviously needed to evaluate realistically the likely success of TOD and the expensive investments in new transit capacity that it requires.

A major effort to coordinate and cross-fertilize the Nationwide Personal Transportation Survey with other national surveys could provide a better understanding of consumer preferences,

industry location decisions, and household activities that determine travel patterns. Marshaling the collective power of these surveys will help in setting pragmatic national, state, and local policy on transportation and land use, and in determining the most cost-effective allocation of federal and local transportation funds. The nation needs to take a comprehensive and systematic approach to data that do justice to the longer planning horizon implicit in the TOD paradigm.

## INTRODUCTION

Low-density, separated-use development has become the predominant land use form across much of urban America in the post-World War II period. This form's connection to the large growth in personal and commercial travel in the same time span is well recognized, if not fully understood. Concerns over the impact of land use and personal transportation on the human and natural environment have been voiced in rising and falling crescendos over the last fifty years. Recently, concern has risen anew in response to the continuing growth and spread of urban development, and to the potential linkage between increasing travel and the greenhouse gases responsible for the suspected warming of the earth's atmosphere.

Global warming aside, public concern over growing congestion is the most visible manifestation of problems linked to current urban form. In reaction, the federal government, states, local jurisdictions, metropolitan planning organizations, and transit agencies have adopted policies and strategies directed at reshaping development into more compact, mixed-use patterns. These efforts have been encouraged by numerous non-governmental organizations and individuals who view our current land use patterns as both environmentally and socially damaging.

Several federal agencies, including Department of Transportation, Department of Housing and Urban Development, and Environmental Protection Agency have initiated efforts to encourage more compact and efficient patterns. These new initiatives include expenditure programs announced in January 1999 by the Federal administration to protect sensitive lands and leverage new, more intensive forms of development (Table 1). They supplement efforts begun under ISTEA and continued under TEA-21 to rate new mass transit starts on the basis of a set of land-use criteria. Projects receive higher ratings and are more likely to be funded when there are transit-supportive land use conditions and government policies, including regional growth management policies to control dispersed development (*1*).

**TABLE 1. New Federal Transportation-Land Use Initiatives**

Agency	Program
Environmental Protection Agency	Better America Bonds -- \$700 million over five years
Department of Transportation	Transportation and Community and System Preservation Pilot -- \$50 million in FY 2000
Department of Housing and Urban Development	Regional Connections Initiative -- \$50 million in FY 2000

One policy that has gained wide acceptance is transit-oriented development (TOD). TOD has over the last decade become the dominant urban planning paradigm in the United States. Proponents of TOD envision dense, mixed-use activity centers connected by high quality transit systems. MPOs, local governments, and public transit agencies have launched major efforts to direct growth to existing centers, infill sites, and new suburban communities, and in some cases to constrain growth from leap frogging and spilling into adjacent jurisdictions.

These efforts are motivated by the belief that new urban forms, which in some ways replicate older forms, will produce significant transportation benefits. TOD will, it is assumed, shift the mode for both work and non-work travel, inducing more pedestrian and transit trips, and reduce both the average length and frequency of household auto travel.

TOD often involves major new transit capacity investments, usually light and commuter rail systems. These investments are typically made before supportive land uses -- employment, housing, and commercial services --- are in place. And they are made without the assistance of empirical data or even predictive models that can test, with sufficient certainty, the veracity of the assumption that benefits commensurate with costs will be achieved.

Furthermore, the many factors that combine to determine the current patterns of retail structure and consumer behavior are typically missing from the analyses that justify TOD investments (2). Retail, when broadly defined as activities involving shopping, eating out, engaging in recreation and other leisure pursuits, constitutes a major portion of all personal and household trips (3). It also accounts for much of the growing intra urban commercial vehicle travel (4). An understanding of retail structure and derived travel is thus essential for the determination of TOD success.

Information that reveals consumer preferences and activity is important for the purpose of validating two widely-held planning assumptions:

1. TOD, and its required transit expenditures, will actually result in dense, mixed-use centers.
2. These centers will, if created, appreciably change the overwhelming preference for auto mobility.

Whether used in transportation demand models or in more subjective decision-making tools, empirical data can provide insight into consumer, traveler, developer, and commercial owner preferences and real choices.

A number of national surveys currently provide data that are somewhat useful for this purpose. The objective of this paper is to describe how these survey instruments could, if coordinated and focused, produce data even more useful to developing realistic and cost-effective land use and transportation strategies at the regional and local level, and assist in designing national programs intended to encourage improved land and transportation forms.

An ongoing and comprehensive data collection effort in support of reaching a better understanding of the dynamics of urban structure, and the linkages between land use and travel demand should be seen as a national priority. Indeed, the Executive Committee of the Transportation Research Board (5) has identified the impact of new urban development on travel behavior as critical current question in transportation.

## **NATIONAL SURVEYS AND THE LAND USE-TRANSPORTATION CONNECTION**

The federal government carries out several periodic surveys that contribute to an understanding of land use and transportation, as well as their linkage (Table 2). These surveys, plus a national housing survey conducted by a private corporation, provide opportunities to measure the strength of consumer preferences for activities and housing locations that have a direct bearing on the success of TOD.

Our purpose here is to indicate the general areas that might provide data useful to TOD planners, and not to suggest detailed changes in these instruments. Nor do we attempt to design their coordinated application. Both are the subject of future work. We merely suggest where the special focus of these surveys might be broadened slightly to produce data of utility to TOD planners. To the extent the Census Bureau's new American Community Survey, scheduled for full implementation by 2003, replaces any of the current surveys and permits specialized supplements, our suggestions would apply there as well.

**TABLE 2. National Surveys that Support an Understanding of TOD**

Survey	Agency	Frequency	Most recent available	Disaggregation, local/regional coverage
Nationwide Personal Transportation Survey	Federal Highway Administration	5 years	1995	MPO add-ons
American Housing Survey	Bureau of Census for Department of Housing and Urban Development	Every 2 years	1995	Metropolitan areas approximately every 4 years
Fannie Mae Housing Survey	Fannie Mae (private corporation)	Annual since 1992	1998	
Survey of Construction, Housing Starts by Design	Bureau of the Census	Monthly	1997	
Consumer Expenditure Survey	Bureau of Labor Statistics	Annual	1997	
Economic Census	Bureau of the Census	Every 5 years	1997	ZIP code area, county, metropolitan area

## **Nationwide Personal Transportation Survey**

The Nationwide Personal Transportation Survey (NPTS) provides valuable insights into the ever-changing activity patterns and derived travel by Americans. The categories of trips used in the NPTS, especially those for non-work trips, reflect in a broad way the growing variety and intensity of our maintenance and leisure-time activities. In 1995, trips from work or school to eat out were for the first time disaggregated from other family and personal business (4). This discrete trip purpose marks the importance of the spatial separation of nonwork activities that contribute to auto mode choice for commuting.

Several opportunities that would reveal more detail regarding nonwork activity locations and travel, and that would assist TOD planning, could be pursued with minor changes in the NPTS, as follows.

### *Nonwork Trip Purpose Specificity*

The activities that generate intermediate stops on home to work, work to home, and work to work auto tours are candidates for relocation in TOD station areas. If located at transit stations, these activities could conceivably induce mode shifts to transit. It would be helpful, then, to know the specific activities that represent the greatest frequency of stops in both directions of commute tours and work-based tours. For example, if the purpose of the stop is for other family and personal business, how often is the stop to drop off or pick up children at a day care facility? Or if the stop for purposes of shopping, what kind of store is being patronized and what is being purchased? Local governments and transit agencies involved in TOD station area design could then use this additional trip purpose detail, if it reveals clear patterns, in the planning and development of commercial areas within TODs.

### *Location Flexibility*

It would be useful to know more about the location choice logic used by travelers for non-work trips that are chained with work trips and other nonwork trips in home to home tours. In particular, it would be instructive to know whether the destinations for these trips are considered to be fixed or flexible. Some destinations that may appear flexible, such as day-care centers, may be considered fixed in that they are selected for their particular attributes, e.g., quality and cost. Even though a day-care center may be located at a transit center, its proximity to transit may not outweigh other factors that make another center more attractive.

### *Route Deviation*

The NPTS does not ascertain whether the driver deviated from the most direct route to make stops on home to work and work to home tours, and by how far. Although the geographic locations of these trip ends has been recorded in add-ons for some large MPOs, at least in one recent case it has not proven to be sufficiently reliable (6). Both national data and regional data, the latter obtained by one or more well designed and executed case studies via NPTS add-ons,

would provide some indication of willingness to divert for non-work purposes. These data would be helpful in assessing the pull that some non-work activities have and the likely effect if they could be located at station areas.

### *Local vs. Non-Local Stops*

An issue related to route deviation is the location of the stop relative to the work and home ends. TOD assumes that mixed land-use neighborhoods provide local destinations that obviate the need for residents to stop at, and perhaps to make longer trips to, non-local destinations. McCormack (7), in a study of commuters living in three Seattle mixed-use neighborhoods, found that more than two-thirds of stops for all trip purposes were outside of the immediate neighborhood. McGuckin and Murkami (8) suggest the importance of determining whether stops occur close to the home end or work end, and how this varies by purpose, as an extension of NPTS research.

### **American Housing Survey**

The American Housing Survey collects data on the status and condition of the Nation's housing stock. The survey returns to the same housing units year after year, and thus can analyze the movement of households through housing. Specifically, it can probe for the reasons people move and choose their new neighborhood.

### *Reasons for Moving and New Location Selection*

Among the many reasons cited for leaving a previous home, the desire to establish one's own household and the need for more space ranked highest in the most recent nationwide survey (9). Among the top reasons for choice of neighborhood, the attributes of the house itself and its convenience to job were given most often, while convenience to public transportation was eighth.

TOD obviously presents a situation where combinations of reasons may be present, not just discrete reasons. Conceptually it suggests that people will move to a TOD because it offers convenience to public transportation and the work destination accessibility it provides, as well as to local shops and services. Rather than asking respondents for all reasons that were involved in their choice of neighborhood, the American Housing Survey could be designed to reveal the logical linkages of reasons. It also might investigate what tradeoffs were involved in choosing a neighborhood. For example, was housing cost or space sacrificed for convenience to job and to public transportation?

The impact on home location of working at home and using telecommunications as a substitute for travel -- including the cases of both telecommuting to a job site and self-employment in a home-based business -- could also be analyzed if questions were asked on the tradeoff between living in a less accessible location, and having to travel from home fewer times per week.

### *Self-selection by Transit Riders*

Transit ridership gains experienced by new rail systems may be in part the result of current transit riders choosing to live in TODs. In particular, bus riders may move close to rail stations in order to ride a faster mode of public transit. A recent study in Portland indicated that this factor may have complicated observed ridership increases in a light rail corridor (10). Since the number of TODs nationally is still small, the American Housing Survey could not provide data to clarify this issue. Yet, for planning purposes, it would be instructive to know whether there is a predisposition to live in a transit-convenient location were it available, and how significant it will be in the longer term. Will it be more than a small niche market, or will most home buyers and renters be attracted by the affordability of housing on the metro fringe, as well as to other attributes of suburban and exurban living?

### **Fannie Mae's National Housing Survey**

National surveys commissioned annually by Fannie Mae provide some perspective on Americans' housing preferences, including type of home, size, location, and locational amenities. The surveys have been changed each year to uncover different features of the housing market (11).

#### *Housing Type and Size Preferences*

For the past 30 years the housing market has produced a growing proportion of single family units with steadily increasing floor area. New multifamily units have also been increasing in size, growing 20% in average floor area from 1988 to 1997. The low mortgage interest rates, relaxed borrowing requirements, and strong economy of the late 1990's have pushed home ownership to record levels.

In 1996 Fannie Mae asked adult American about their attitudes towards housing and home ownership. Of those contacted, 73 % said their ideal home is a single-family detached house with a yard on all sides. This compares to a current ownership rate of all types of homes, including townhouses and condos, of about 64 %. The same survey found that Americans are willing to make significant tradeoffs for home ownership. Four of five would drive a longer distance to work if they could own rather than rent a home.

Fannie Mae's most recent survey, in 1998, indicates that a majority of renters have a strong desire to move up to ownership. It will be of interest to see if the detached single-family preference and size trends continue as ownership rates increase.

Architects and planners who support TOD believe that Americans will look favorably on detached houses on smaller lots, perhaps even to smaller and attached housing, if attractive amenities such as parks, other public spaces, and stores are located in close proximity. They also believe that the design elements of dense housing can be varied and made attractive. The Fannie Mae survey would seem to be an ideal instrument to delve into preferences involving size and amenity tradeoffs.

### *Locational Preferences*

Fannie Mae's 1997 survey asked people where they would like to live in the geographical range from central city to small town. A large majority indicated they preferred either a small town or a suburb near a large city. Only nine percent favored a large city. Since new community designs are intended to replicate the feel of a small town and enhance sense of community, it would be useful to extend this locational preference question to include alternative environments such as TOD and planned neo-traditional communities.

### *Baby Boom Impact*

Fannie Mae also explored the future housing preferences of Baby Boomers in its 1998 survey. The fraction of the US population age 55 and over will increase from 21% in 1995 to over 29% in 2020. There has been much speculation whether these "empty nesters" may choose to down size their housing and opt for more locational convenience. In the Fannie Mae survey a majority, 53%, said they will remain in their current house, either as is or with renovations, while 35 % indicated that they would sell, and either buy or rent a new house. The survey did not probe whether the size of the new house had been considered in retirement plans.

### **Survey of Construction**

The Census Bureau surveys monthly the number of new privately owned housing units for which construction is started. Occasional supplemental reports provide detail on the type of design and intended use of structures for a calendar year. The most recent was issued in February 1998 for 1997. Of particular importance to TOD are data that distinguish between one unit, i.e., single-family, structures that are detached, and one unit structures that are attached, such as townhouses that share a common wall. The proportion of attached structures provides one measure of the density that TOD seeks to achieve. In 1997, approximately 9 percent of one-unit structures were attached units (12), a fraction that has not changed appreciably over the 25 years this information has been collected. The reliability of these data could be improved by increasing the sample size. And, by making these data a regular and prominent part of the Survey of Construction, important trends in the data would be apparent and their usefulness would be enhanced.

### **Economic Census**

Only limited data are available describing the current commercial structure and consumer patterns of metropolitan regions. Furthermore, trends in what is a very dynamic consumer marketplace have not been carefully tracked. The US Economic Census, which is conducted at five year intervals, provides aggregate numbers of firms, employees, and sales by economic sector for metropolitan areas. Of particular interest to TOD are data for retail trade, service industries, and arts, entertainment and recreation. However, because sector definitions have changed over the years, major trends are difficult to analyze with precision. The sectors were modified again in the 1997 Economic Census which used the new North American Industry Classification system (NAICS). And the data do not always capture the fine structure of retail and service activities at a geographical scale that reveals important structural changes. For example, major and medium-



sized retail centers in standard metropolitan statistical areas were disaggregated only in 1982 (13). In other years, the finest disaggregation is for zip code areas which only allows retail activity of individual centers to be approximated.

The Economic Census could be the source of very useful information regarding the ongoing changes taking place in the commercial structure of the nation's major metropolitan areas. Disaggregating data to the major retail center level could provide five-year snapshots of the mix of retail, service, and entertainment establishments in each center. This would assist in tracking the evolution and adaptation of older activity centers as market conditions change. And it would help uncover whether new activity centers are replicating the structure of older centers or are developing new retail patterns that are more supportive of transit.

New questions that measure the extent of online purchasing and other electronic commerce in support of trade relationships with upstream suppliers, business-to-business customers, and household consumers would also be helpful in assessing the prospects of structural change in physical travel. Measurements of the extent of telecommuting by employees would also be helpful in illuminating trends in commuting travel.

### **Consumer Expenditure Survey**

The buying habits of Americans are tracked by the Consumer Expenditure Survey. Of particular interest are trends in consumer purchases that reveal trends in travel behavior. For example, the survey indicates that eating out has taken an increasingly larger share of the food dollar. In 1996 food consumed away from home accounted for 39% of personal food expenditures, while in 1984 it was 26%. These Consumer Expenditure data would be more useful to TOD planning if they were disaggregated by type of eating establishment, e.g., fast food restaurant, sit down restaurant, convenience store.

## **RECOMMENDATIONS**

Niles and Nelson (14) have identified 16 distinct factors that determine the success of TOD (Table 3). The strength of several of these factors can be elucidated with the help of data produced through relatively minor supplements to national surveys. We recommend survey additions to support understanding of the following factors:

### **Consumer Activity Patterns**

- The NPTS should report nonwork stops in commute tours with greater specificity regarding purpose.
- The Consumer Expenditure Survey should identify the various categories of eating-out establishments and the fraction of the food dollar each represents.
- The Economic Census should measure the growing extent of electronic purchasing by consumers.

## **Retail Market Structure**

- The Economic Census should provide data for the number of stores by NAIC category disaggregated to the major retail center level.

## **Travel Behavior/Trip Chaining**

- The NPTS should explore the flexibility of locations at which stops are made for non-work purposes in commute tours.
- The NPTS should, through geocoding of stop locations, investigate the extent of route deviation in commute tours and the location of stops relative to work and home.
- The Economic Census should measure the growing extent of electronic commerce and telecommuting, both of which impact travel behavior.

## **Housing Density, and Housing Type and Size Preference**

- The Fannie Mae housing survey should investigate attitudes toward small houses on small lots with close-by amenities as a trade off to large houses on large lots.
- The Fannie Mae survey should explore the extent to which people equate the sense of community provided by a TOD with that experienced in a small town.
- The Fannie Mae survey should explore Baby Boomer' plans to down size housing upon retirement.
- Detail on the design of new residential housing starts should be a more prominent part of the Survey of Construction, and data reliability should be improved.
- The American Housing Survey should include questions that permit an assessment of the effect of telecommuting and home businesses on housing location choices.

## **Residential Self-selection**

- The American Housing Survey should inquire into the combinations of reasons that people deem important for choosing a neighborhood.

**TABLE 3. Factors Determining Regional Success of TOD, and National Surveys That Could Produce Data Useful to Analysis of Success**

<b>Success Variable</b>	<b>National Survey Supporting TOD Analysis</b>
Number of TODs (& station areas)	
Transit quality	
Transit technology	
Street pattern	
Station area parking	
Employment and housing density	Fannie Mae Housing Survey; American Housing Survey
Commercial mix	
Retail siting criteria	
Regional market structure	Economic Census
Consumer activity patterns	NPTS; Economic Census
Travel behavior/trip chaining	NPTS; Economic Census
Zoning flexibility	
Resident reactions	
Housing type preference/life style & life stage	American Housing Survey; Survey of Construction
Self-selection in residential choice	American Housing Survey
Government policies	

## **CONCLUSIONS: BENEFITS OF A COORDINATED TOD DATA EFFORT**

A national effort of systematic and coordinated data collection and analysis would significantly improve our understanding of the potential for transit-oriented development to reshape the urban environment and reduce the undesirable impacts of metropolitan growth. Such an effort would help sharpen the focus of national policy, strategy, and funding support directed at land use and transportation, and their environmental and social impacts. And better data would improve decision-making on regional and local land use and transportation policy, including decisions regarding major transportation infrastructure investments.

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